

VASCULAR FLORA OF TWO CALCAREOUS PRAIRIE REMNANTS ON THE KISATCHIE NATIONAL FOREST, LOUISIANA

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ABSTRACT

The floristics and edaphic factors of two remnant Louisiana calcareous prairies are described. The soil is rich in calcium and supports a diverse plant community similar to the western and midwestern tall grass prairies. In presettlement times, prairies were widely distributed and much more common in central and north Louisiana than they are today. Because of anthropogenic disturbances – fire suppression, grazing, forestry, and agriculture – prairies are now rare.

KEY WORDS: prairie, Kisatchie National Forest, floristics, Louisiana

INTRODUCTION

The disappearance of the native grasslands of the United States over the past two centuries is well documented (DeSelm & Murdock 1993; Sims 1988; Smeins & Diamond 1988; Madson & Oberle 1993). Their occurrence in and disappearance from the southeastern United States in general is less well documented (DeSelm & Murdock 1993; Frost *et al.* 1988). From historical accounts, it would appear that in presettlement times there were numerous fairly large prairies scattered across northern and central Louisiana (see references and descriptions in Flores 1984; Smith *et al.* 1989; Hart & Lester 1993) and that due to anthropogenic activities, notably fire suppression, grazing, and farming, these have almost vanished. While there can be no accurate estimate of the original extent of prairies in Louisiana, fewer than 1000 acres appear to remain in relatively natural condition and are ranked as critically imperiled by the Louisiana Natural Heritage Program (Smith *et al.* 1989; Martin & Smith 1991). The remaining few sites are crucial refugia for certain rare plants. It is imperative, therefore, to obtain information about the distribution of prairies and on species composition and abundance in these remnant communities.

Some of the best remnants of this community type in Louisiana occur on the Kisatchie National Forest, notably in the Winn District in Winn and Grant parishes (Smith *et al.* 1989; Martin & Smith 1991). But there are a few remnants elsewhere (Norman 1991; Hart & Lester 1993). In this paper we report on the floristics of two prairie remnants on the Kisatchie District of the Kisatchie National Forest in Natchitoches Parish.

STUDY SITES AND METHODS

In the course of our work on sandstone outcrop communities (MacRoberts & MacRoberts 1993), we located two very small calcareous prairie remnants in association with calcareous forest habitat in the Kisatchie District of the Kisatchie National Forest (T5N R6W S4) (see Caldwell [1991] and Martin & Smith [1991] for descriptions of the Kisatchie National Forest). The larger, K50H Prairie, measures about 0.4 ha.; the smaller, Ratibida Prairie, measures about 0.2 ha. They are about one km apart. Both are openings dominated by composites, grasses, and legumes. They are on or near the summits of hills, are bisected by logging roads, and are close to, but do not abut, sandstone outcrop communities. Both prairies are surrounded by calcareous forest, which often has a midstory of dense stands of *Crataegus* spp., *Rhus copallina* L., *Viburnum dentatum* L., *Cornus drummondii* C.A. Mey., *Diospyros virginiana* L., and *Prunus* spp., species that invade prairies in the absence of fire.

We visited these two prairies every two to three weeks between the summer of 1993 when we first discovered them, and the autumn of 1994. During these visits we collected or recorded all vascular plants encountered and took soil samples for analysis. We follow MacRoberts (1984, 1989), Gandhi & Thomas (1989), and Allen (1992) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are in the Vanderbilt University Herbarium (VDB) and Range Management Research Herbarium, Southern Forest Experiment Station, U.S. Forest Service, Pineville, Louisiana (SFRP).

While the specific fire history of these prairies is uncertain except that they have not burned in years, they are embedded in the pyrogenic longleaf pine community and thus probably burned every 1 to 3 years in presettlement times (Smith 1991).

For comparative purposes and in order to monitor rare species, we made irregular visits to the calcareous prairies on the Winn Ranger District in Winn and Grant parishes (Smith *et al.* 1989; Martin & Smith 1991) 65 km northeast of the study sites and to a prairie on Fort Polk, Vernon Parish (Hart & Lester 1993) 40 km south of the study sites.

Climatic data are given in Martin *et al.* (1990). Annual precipitation averages about 125 cm and is fairly evenly distributed throughout the year. In summer, temperatures rise to 35° C; this, combined with short droughts,

translates into very hot and dry conditions especially in open areas. Under these conditions the calcareous soils tend to dry, forming wide cracks. When wet, these soils are very sticky. In all the prairies we have examined, small calcareous concretions are common (Martin *et al.* 1990; Smith *et al.* 1989).

Soil samples were taken from the upper 15 cm of the Kisatchie prairies and from two prairies in the Winn District for comparison. Samples were analyzed by A & L Laboratories, Memphis Tennessee.

The study sites are about 90 meters above sea level.

RESULTS

Table 1 lists the vascular plants found in K50H and Ratibida prairies. The letter "H" following the species indicates presence at K50H; "R" indicates presence at Ratibida, and no letter indicates presence at both prairies.

Table 2 gives information on the soil characteristics of the Kisatchie and Winn District prairies. Five samples from the two Kisatchie prairies and five from the two Winn District prairies (T11N R4W S18, T11N R5W S26) were analyzed. The samples from each prairie are averaged since they were very similar. Soil from adjacent calcareous forest on the Kisatchie District (T5N R6W S4) was also analyzed. The soils from the Kisatchie District are thought to be part of the Lena Member of the Fleming Formation of Miocene age (Louisiana Geological Survey 1984).

The soils of calcareous prairies in Louisiana are not well studied and are currently being revised. Most if not all prairies in Winn and Grant parishes are now "...in the newly described Keiffer series" (Martin & Smith 1991:63), see also Smith *et al.* 1989:3).

DISCUSSION

We recorded a total of 109 taxa representing 85 genera and 38 families for the two prairies. K50H had 92 species and 71 genera, and Ratibida had 76 species and 64 genera, making them as rich in species as similar sized bogs and outcrop communities (MacRoberts & MacRoberts 1992, 1993).

Smith *et al.* (1989) provides a preliminary list of species from several of the Keiffer Prairies on the Winn District, Winn Parish. We have subsequently made cursory surveys of the Keiffer Prairies, adding to their list. Comparing these data with the list we made for the Kisatchie District prairies shows that they are basically the same community, having their greatest resemblance to the tallgrass prairies of Arkansas, east Texas, Mississippi, and Alabama (Smith *et al.* 1989; Carr 1993). Both the Keiffer prairies and the Kisatchie District prairies are dominated by grasses, composites, and legumes, which make up approximately 50% of the total species. Since the data were not collected in

Table 1. Species in K50H and Ratibida prairies.

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- ACANTHACEAE *Ruellia pedunculata* Torrey ex A. Gray
- AGAVACEAE *Manfreda virginica* (L.) Rose
- ANACARDIACEAE *Rhus copallina* L.
- APIACEAE *Eryngium yuccifolium* Michx. H
- APOCYNACEAE *Apocynum cannabinum* L.
- AQUIFOLIACEAE *Ilex decidua* Walt. R, *Ilex vomitoria* Aiton
- ASCLEPIADACEAE *Asclepias viridiflora* Raf. H, *A. viridis* Walt.
- ASTERACEAE *Ambrosia artemisiifolia* L., *Aster dumosus* L. H, *Aster oolentangiensis* Ridd., *Aster patens* Dryand. ex Aiton, *Aster sericeus* Vent. var. *microphyllus* DC. H, *Cacalia plantaginea* (Raf.) Shinnery H, *Coreopsis lanceolata* L., *Erigeron strigosus* Muhl. ex Willd., *Erigeron tenuis* Torrey ex A. Gray H, *Eupatorium serotinum* Michx. H, *Gnaphalium obtusifolium* L. H, *Helianthus hirsutus* Raf., *Liatris pycnostachya* Michx., *L. squarrosa* (L.) Michx., *L. squarrolosa* Michx., *Pyrrhopappus carolinianus* (Walt.) DC. H, *Ratibida pinnata* (Vent.) Barnh. R, *Rudbeckia hirta* L., *Silphium integrifolium* Michx., *Silphium laciniatum* L. H, *Solidago nitida* Torrey & Gray, *Solidago radula* Nutt.
- CAMPANULACEAE *Lobelia appendiculata* A. DC. H
- CAPRIFOLIACEAE *Viburnum dentatum* L. R
- CLUSIACEAE *Hypericum hypericoides* (L.) Crantz
- CORNACEAE *Cornus drummondii* C.A. Mey., *Cornus florida* L. H
- CUPRESSACEAE *Juniperus virginiana* L.
- CYPERACEAE *Carex cherokeensis* Schwein., *C. flaccosperma* Dewey R, *C. meadii* Dewey H, *Scleria oligantha* Michx.
- EBENACEAE *Diospyros virginiana* L.

Table 1 (continued)

EUPHORBACEAE *Chamaesyce cordifolia* (Ell.) Small H, *Euphorbia corollata* L. H

FABACEAE *Cassia fasciculata* Michx., *Centrosema virginianum* (L.) Benth., *Dalea candida* (Michx.) Willd., *Dalea purpurea* Vent., *Desmanthus illinoensis* (Michx.) MacM. ex Robins. & Fernald H, *Desmodium* sp., *Galactia volubilis* (L.) Britton, *Lespedeza* sp., *Neptunia lutea* (Leavenworth) Benth. H, *Rhynchosia* sp. R, *Schrankia microphylla* (Dryand.) J.F. Macbr. H, *Tephrosia virginiana* (L.) Pers. H

GENTIANACEAE *Sabatia campestris* Nutt.

GERANIACEAE *Geranium carolinianum* L. H

IRIDACEAE *Sisyrinchium langloisii* E. Greene

LAMIACEAE *Prunella vulgaris* L., *Pycnanthemum albescens* Torrey & Gray, *Salvia azurea* Michx. & Lam., *Salvia lyrata* L., *Scutellaria elliptica* Muhl. R

LOGANIACEAE *Gelsemium sempervirens* (L.) St. Hil. H

MYRICACEAE *Myrica cerifera* L.

ONAGRACEAE *Gaura* sp.

OXALIDACEAE *Oxalis corniculata* L. H

PASSIFLORACEAE *Passiflora lutea* L. R

PINACEAE *Pinus echinata* P. Mill., *P. taeda* L.

POACEAE *Andropogon gerardii* Vitman, *Andropogon glomeratus* (Walt.) B.S.P. H, *Andropogon ternarius* L. H, *Andropogon virginicus* Michx. R, *Aristida oligantha* Michx., *Chasmanthium sessiliflorum* (Poir.) Yates R, *Dichantheium aciculare* (Des. ex Poir.) Gould & Clark, *D. acuminatum* (Sw.) Gould & Clark H, *D. dichotomum* (L.) Gould H, *Eragrostis spectabilis* (Pursh) Steud., *Muhlenbergia capillaris* (Lam.) Trin. H, *Panicum anceps* Michx., *Paspalum* spp., *Schizachyrium scoparium* (Michx.) Nash, *Schizachyrium tenerum* Nees, *Setaria geniculata* (Lam.) Beauv., *Sphenopholis obtusata* (Michx.) Scribn., *Tridens flavus* (L.) Hitchcock R

Table 1 (continued)

POLEMONIACEAE *Phlox pilosa* L.

POLYGALACEAE *Polygala verticillata* L.

RANUNCULACEAE *Anemone caroliniana* Walt. H, *Delphinium carolinianum* Walt. R

RHAMNACEAE *Berchemia scandens* (Hill) K. Koch, *Ceanothus americanus* L.

ROSACEAE *Crataegus crus-galli* L., *C. marshallii* Eggelston, *C. spathulata* Michx., *Prunus umbellata* Ell. R, *Rubus* sp. H

RUBIACEAE *Galium pilosum* Aiton R, *Hedyotis nigricans* (Lam.) Fosberg

SCROPHULARIACEAE *Agalinis fasciculata* (Ell.) Raf. H, *A. skinneriana* (Wood.) Britt. H, *Penstemon tubaeformis* Nutt. H

VERBENACEAE *Callicarpa americana* L. R, *Glandularia canadensis* (L.) Nutt., *Verbena halei* Small H

VIOLACEAE *Viola walteri* House R

VITACEAE *Vitis mustangensis* Buckl. R

Table 2. Soil Characteristics. Numbers in parentheses indicate number of samples analyzed.

Sample	pH	Exchangeable Ions (ppm)				OM%
		P	K	Ca	Mg	
Prairies (Kisatchie District, Natchitoches Parish)						
Ratibida (3)	7.7	3	182	7330	90	6.7
K50H (2)	7.8	1	174	6485	60	4.6
Prairies (Winn District, Winn Parish)						
Carpenter (3)	7.8	3	137	3667	51	7.4
Coldwater (2)	7.7	1	183	5145	73	7.0
Calcareous Forest (Kisatchie District)						
K50C (1)	5.9	3	234	6530	308	8.7

the same manner for the Kisatchie District prairies and the Keiffer prairies (the latter list was drawn from a much larger area and from surrounding calcareous woodlands), it is not possible to calculate an accurate Index of Similarity. However, as the data currently stand, we calculated Sorensen's Index of Similarity to be 48. This figure undoubtedly would be much higher if prairie sizes were equalized and the calcareous woodland data excluded. Probably more meaningful is a direct comparison between the Kisatchie District species list and the Keiffer list. This shows that 75% of the Kisatchie District prairie species have also been reported for the Keiffer prairies.

Why do prairies remain open? It is believed that the physical properties of the soil (calcareous, high shrink-swell potential), climatic conditions that lead to moderately long droughts in the hot summer months, and frequent fire are responsible. Smith *et al.* (1989) conducted a limited study of the effect of fire on some of the Keiffer prairies. This research supports the findings of many others regarding the importance of fire in maintaining prairie communities. Fire suppression would explain the apparent dramatic loss of so many prairies over the last two centuries. All else being equal, fire suppression apparently leads to slow but steady invasion by woody species such as *Crataegus*, *Diospyros virginiana*, *Berchemia scandens*, *Juniperus virginiana*, *Ilex decidua*, and *Cornus drummondii*.

The relationship between fire suppression and woody plant encroachment was noted early in the nineteenth century. In 1806, Thomas Freeman, surveyor, and Peter Custis, naturalist, explored the Red River north to the present day Arkansas/Oklahoma/Texas border and wrote about the role of fire in the maintenance of the many prairies they visited in Louisiana and southwest

Arkansas. While emphasizing native Americans as the source of the fires, Freeman says: "The extensive prairies which are found in this rich and level country, appear to be owing to the custom of these [Indian] nations . . . burning the grass at certain seasons. It destroys the brushes and underwood, and in some instances the timber, preventing the future growth where once the timber is destroyed. . . . It is observed, that where these prairies are enclosed, or otherwise protected from fire, they soon become covered with bushes and timber trees, a circumstance which proves, that neither the nature of the soil, nor any other natural cause, gives rise to these extensive and rich prairies. . . ." (Flores 1984:210).

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